

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 19

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SUDHIR K. MADAN

Appeal No. 96-1449
Application 08/188,630¹

ON BRIEF

Before THOMAS, BARRETT, and LEE, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

¹ Application for patent filed January 27, 1994, entitled "Stacked DRAM Structure," which is a continuation of Application 07/919,345, filed July 23, 1992, now abandoned.

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This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 9-28, all of the claims pending in the application.

We reverse.

BACKGROUND

The disclosed invention is directed to a stacked capacitor structure for semiconductor memory devices. Storage electrodes of prior art stacked capacitors are limited in distance from neighboring circuit elements and from each other by the minimum lithographic feature size F , as shown in figure 4. Appellant forms a conformal conductor layer over the storage electrode to a thickness T enlarging the dimensions of the storage electrode by $2T$, which reduces the distance between neighboring circuit elements, as shown in figure 5.

Claim 9 is reproduced below.

9. A microelectronic device, said microelectronic device comprising:

- a) a substrate including a conductive region;
- b) an insulating layer overlying said substrate having a storage node contact window overlying a selected area of said conductive region;
- c) a storage electrode comprising a stem-shaped

section and a crown-shaped section, said stem-shaped section lying within said storage node contact window and in electrical communication with said conductive region of said substrate and extending above said insulating layer, said crown-shaped section electrically connected to and overlying said stem-shaped section;

d) a storage electrode enlarging layer conformably covering and in electrical communication with selected portions of said crown-shaped section of said storage electrode and that portion of said stem-shaped section of said storage electrode that extends above said insulating layer, and overlying the portion of said insulating layer that lies beneath said crown-shaped section of said storage electrode;

e) a dielectric layer conformably covering said storage electrode and said storage electrode enlarging layer; and

f) a conductive layer covering said dielectric layer and forming a plate electrode capacitively-coupled to said storage electrode and said storage electrode enlarging layer.

The examination team (hereinafter, the "examiner")
relies on the following prior art references:

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|----------------------------|---------------------|--------------|
| Bae et al. (Bae) | 5,095,346 | March 10, |
| 1992 | | |
| Reinberg et al. (Reinberg) | 5,142,438 | August 25, |
| 1992 | | |
| | (filed November 15, | |
| 1991) | | |
| Ogawa et al. (Ogawa) | 5,164,337 | November 17, |
| 1992 | | |
| | (filed October 31, | |
| 1990) | | |
| Hamamoto et al. (Hamamoto) | 5,235,199 | August 10, |

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1993
1992)

(filed February 7,

Claims 9-13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ogawa or Bae in view of Reinberg. With regard to the "storage electrode enlarging layer," the examiner states (Office Action entered July 12, 1994, Paper No. 10, page 3, referred to in the Final Rejection, Paper No. 13; Examiner's Answer, page 4):

It does not matter how the enlarging layer is made, the final product is still the same. The storage electrode and the enlarging layer are made of the same material, therefore an arbitrary border can be drawn around the outer periphery of the storage electrode and labeled an enlarging layer.

The examiner further finds that Ogawa and Bae do not teach a dielectric layer of tantalum pentoxide as recited in claim 12 and concludes that providing a layer of tantalum pentoxide would have been obvious over Reinberg (Paper No. 10, page 4; Examiner's Answer, page 4).

Claims 14-28 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ogawa or Bae in view of Reinberg, further in view of Hamamoto. The examiner finds that "Ogawa et al. or Bae et al. do not include at least two capacitors

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which can be considered [an] array" (Paper No. 10, page 4; Examiner's Answer, page 5). The examiner concludes that it would have been obvious to arrange two capacitors having the structures of Ogawa or Bae in an array in view of the two capacitors taught by Hamamoto (Paper No. 10, page 4; Examiner's Answer, page 5).

We refer to the Examiner's Answer (Paper No. 16) (pages referred to as "EA__") for a further statement of the examiner's position and to the Appeal Brief (Paper No. 15) (pages referred to as "Br__") for the appellant's position.

OPINION

The examiner errs by failing to give patentable weight to the claimed storage electrode "enlarging layer." The claims recite an "enlarging layer conformably covering and in electrical communication with" selected portions of the storage electrode (claims 1 and 21) or first and second storage electrodes (claim 14). It is clear that the "enlarging layer" is separate structure in addition to the storage electrode. Neither Ogawa nor Bae has a distinct and separate "enlarging layer" on the storage electrode. Ogawa discloses a storage electrode 11 covered with a dielectric

film 12 and a cell plate 13 (figure 1H). Bae discloses a stacked capacitor which comprises a hollow storage electrode 22 of polysilicon layers 19, 21, and 23 (figure 3) around an oxide core 20 (figure 4F), the storage electrode being covered with a dielectric film 24 and then with a plate electrode layer 25 (figure 3). Bae discloses that several capacitors can be manufactured at the same time (col. 4, lines 23-35).

Although no case law support has been cited for the examiner's position, we interpret the statement that "[i]t does not matter how the enlarging layer is made, the final product is still the same" (Paper No. 10, page 3; EA4) to be product-by-process-type reasoning. The patentability of product-by-process claims is discussed in In re Thorpe, 777 F.2d 695, 697, 227 USPQ 964, 966 (Fed. Cir. 1985):

[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself.
[Citations omitted.]

The patentability of a product does not depend on its method of production. If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the product was made by a different process. [Citations omitted.]

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The rejection states that because the final product is a conductive storage electrode, it does not make a difference whether or not the storage electrode was covered with an "enlarging layer." We disagree with the examiner's reasoning.

We agree with appellant's rebuttal to the examiner's rejection (Br4):

This argument ignores the fact that the enlarging layer will be detectable as a separate and distinct layer from the storage electrode. The layers may or may not be formed of the same material. Even if they are of the same material, their interface can be found by crystallography or other means.

A storage electrode having an "enlarging layer" is not the same physical product as a storage electrode without an enlarging layer. The examiner's statement that "[t]he storage and the enlarging layer are made of the same material" (Paper No. 10, page 3; EA4), is not accurate. The claims do not require the materials to be the same and appellant has pointed out that even if they were, the structure of the enlarging layer would be distinguishable from the structure of the storage electrode. The fact that two structures, a storage electrode covered by an enlarging layer and a storage electrode of the same overall size but

without an enlarging layer, may be electrically identical does not mean they are physically and mechanically identical in structure. Therefore, we conclude that the examiner has failed to establish a prima facie case of obviousness. The rejection of claims 9-28 is reversed.

The examiner states (EA6): "The examiner has cited the reference Reinberg et al. that teaches the feature of an added conformal layer and discussed reasons why it would be [sic, have been] obvious to use one in Ogawa et al. or Bae et al." We find Reinberg applied in the examiner's actions to teach only using tantalum pentoxide as a replacement for ONO dielectric layers (EA4, two places), not for teaching a storage electrode enlarging layer. Reinberg has a tantalum oxide dielectric layer 33 covered by a thin barrier layer 41 of a material such as silicon nitride to prevent undesirable interaction between layer 33 and the polysilicon cell plate layer (col. 4, line 57 to col. 5, line 1), but does not disclose an enlarging layer on the storage electrode.

CONCLUSION

The rejection of claims 9-28 is reversed.

REVERSED

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| | JAMES D. THOMAS |) | |
| | Administrative | Patent Judge |) |
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| | LEE E. BARRETT |) | APPEALS |
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